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GEOGRAPHIC ASPECTS OF INFORMATION SYSTEMS: Introduction and Selected Bibliography

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INTRODUCTION AND SELECTED BIBLIOGRAPHY

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1. INTRODUCTION

Within the span of a few years the information systems field has become a major growth industry in virtually every technologically developed country in the world. Although many manual systems were and are in operation, the development of high speed electronic computers has brought about a virtual revolution in terms of the quantities of data that are being requested, collected, processed, disseminated and applied at every level of government, in business, in universities, and so on.

The term "information system" has been and is undergoing change in terms of what it means, and a considerable amount of effort has been expended in attempts at definitive statements. Rather than engage in semantic or philosophic arguments we proceed on the premise that an information system is simply a man/

machine complex engaged in activities associated with the specification, acquisition, processing, dissemination, and application of the inputs and outputs of the system.

Our present concern is with the data elements, items, and formats* that enter and flow through the system, that is, the data base of the system.** Each of the five suggested phases of data base development is briefly summarized as follows:

- Data element/item/format specification--involves defining that set of data elements and items and formats which comprise the input to programs, projects, data bases, etc., of the information system.

- Data item acquisition--involves the making and recording of observations (data items) that measure or report on the status of data elements.

- Data element/item/format storage, retrieval, and manipulation--are data handling or processing operations, manual and automated, that are performed upon raw, processed and semi-processed data.

- Data element/item/format dissemination--involves the delivery of data (elements/items/formats) to users (man and/or machine).

- Data applications--are performed by the users (man and/or machine) as they carry out their operations/control/planning-related activities.

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* A data element has two basic parts, a generic part which designates the unit of information and a specific part which, when recorded, designates a particular fact, condition, qualification, or measurement. These specific values or representations are called data items. For example, in the statement, "the speed limit is 30 miles per hour," "speed limit" is generic and "30 miles per hour" is specific. When related to a field of information, "speed limit" is called a data element name. Format refers to the way in which data elements and items are stored in files, fields, and records.

** The relationship between data and information has also been the subject of some discussion. It has been suggested that information may be regarded as enhanced or useful data, and that data are a subset of information. To illustrate, if A + B = C, A and B might be regarded as data and C as information. In an information system context, then, data are inputs and the output of the system is information.

As with any system interaction, feedback, and adjustment occur over time and space, and the activities, operations, etc., in each phase are altered accordingly.

Based on the five proposed phases of data base development, it is possible to generalize and refer to Municipal Information Systems, Urban and Regional Information Systems, Management Information Systems, Geographic Information Systems, and so on. For the most part there is a change in context involved whereby the orientation shifts according to subject matter, political boundaries, attributes of the data in the systems (e.g., geographic), the decision makers or decision-making processes, etc. However, in all these there is a chain of events involved that begins with the input of data elements and items and formats that comprise the system, the system's data base, and the output of data or information that are used for some purpose. By way of analogy, an information system may be likened to an assembly line in that an end product is achieved after specifying, collecting, processing, disseminating, and applying appropriate raw materials that meet the demands of the user or clients of the end product.

The necessity for a bibliography of this type, indeed for a variety of bibliographic types due to the rapid growth of the field, became apparent while conducting research for the Wichita Falls Consortium Municipal Information Systems (MIS) Project, Contract H-1217--Municipal Information Systems, Federal Urban Information Systems Inter-Agency Committee, U.S. Department of Housing and Urban Development.* Few cities, states, or federal

* Barry S. Wellar, Evaluation of Selected Major Information Systems Research and Development Projects: Implications for the Wichita Falls, Texas MIS, Phase I, Volume IV, Section 2 (Springfield, Virgina: National Technical Information Service, 1970), and Barry S. Wellar, A Working Treatise on Data Standardization, prepared for the Wichita Falls Consortium Municipal Information System Project (Lawrence, Kansas: Institute for Social and Environmental Studies, The University of Kansas, 1971).

agencies can afford to fully document all their activities, and as a result the researcher seldom knows just what has been conceptualized, designed, developed or implemented. And, although the listings of which agencies have systems up and running and growing, the listings do not provide the specific kinds of information that are included in this bibliography.

The utility of such a bibliography became even more obvious while conducting a seminar on information systems and computer uses in geography. One of the difficulties that all students faced was the diffuse nature of much of the literature, as it seemed to turn up in a wide variety of journals and conference proceedings in almost every discipline. There are undoubtedly others, but the commonality of the spatial characteristics of data elements and items to many papers further suggested the need to compile selected, and hopefully representative, references in a single volume.

The bibliography which follows, therefore, provides a guide to the diverse body of literature that deals with the geographic or spatial characteristics of the data elements and data items in each of the five phases. As such it should provide planners, geographers, economists, sociologists, and others with useful points of reference concerning one characteristic of data that is common to research efforts in a variety of fields.

2. SOURCES OF REFERENCES

Our objective in the bibliography is to compile a selected body of references that deal with the field in general, as well as with each of the five phases. Since it is a selected bibliography the references included are for the most part those which have an information systems orientation or context. If we did not do this, we would be faced with the task of incorporating as a minimum all dissertations published in the field of Geography! It is recognized that information systems jargon is a fairly recent development, and as a result references are included that do not specifically refer to information systems. The criterion for selection in this regard is whether or not the paper contributes to the field on the basis of content.

The bibliography consists primarily of works that are available in the literature, or can be obtained from public sources such as the Government Printing Office or the federal government. On occasion reports are included that are not yet part of the open literature. They are included in the bibliography only if they are regarded as significant pieces of research, and if they serve to identify persons or firms that are active in a particular field but for some reason have yet to publish their findings in the open literature.

To some degree the bibliography is eclectic, as no systematic body of literature has as yet developed to cover the spatial or geographic characteristics of data elements, items, and formats in an information systems context. This may be due in part to the

many dimensions of the field, with the result being that researchers in various disciplines have concentrated on one or several phases or components of the field. Consequently we have not yet reached the point of simultaneously considering more than one or a few phases, much less integrating the methodologies and activities of the many involved researchers in their various disciplines. The bibliography is illustrative rather than exhaustive, then, and as such serves to indicate the potential for relating activities within and between a number of disciplinary and functional fields.

3. ORGANIZATION OF THE BIBLIOGRAPHY

Part I, "General Works" introduces the reader to books, reports, articles, etc., that deal with information system topics in an extensive manner. These may be general discussions of the field, or general discussions of the geographic or spatial characteristics of data.

Parts II-VI provide references for each of the five phases that are suggested as comprising data base development and maintenance in any information system. Each of the phases is discussed briefly to explain the nature of the references contained in each section:

II. Specification. Regardless of whether the information system is in a federal agency or is maintained by a university researcher, the data elements and items contained in the system must be requested by someone. The data may be required by law, or may be included to permit the testing of a hypothesis. Hence, the

references in this section are those which deal with requests, recommendations, or discussions related to spatial data in government and private sector statistical series, programs, projects, etc., and particularly those having an information system context.

III. Acquisition. After data elements and items are specified, observations, measurements, etc., are taken and recorded, such as during a decennial census. Or, data sets may be acquired by a local municipality from the Bureau of the Census. This section then, contains references that discuss data collection or acquisition in terms of the spatial characteristics of data sets.

IV. Processing. After the raw data are collected, or processed or semi-processed data are acquired, they then become part of the data base under development. The data may be stored, retrieved, manipulated, etc., by manual and/or automated methods. The references in this section, therefore, are those which discuss progress and problems related to the handling of spatial or geographic data.

V. Dissemination. In many cases a central facility processes the data and then disseminates or has them delivered to users. Dissemination can of course occur after application. For example, a university researcher could perform his analysis and then disseminate his findings through a professional journal. The references provided reports on dissemination as it relates to the spatial or geographic aspects of data in terms of graphic, statistical or other forms of output.

VI. Application. Data are requested, collected, processed, and disseminated for the purpose of being used by someone, or some agency. The works included in this section examine or report on the spatial characteristics of data which are used in an information system context in programs and projects of government agencies, university and other researchers, etc.

4. FORTHCOMING ANNOTATED BIBLIOGRAPHY

Due to constraints of time and space it was necessary to close off this bibliography even though additional references were being acquired almost daily. Hence, the present compilation is by no means exhaustive in terms of what is available in the literature. A more extensive, and possibly annotated bibliography is being considered for the near future. We are therefore asking readers who are concerned about omitted references (including both their own and those of others') to apprise us of any oversights, as well as to inform us of any forthcoming documents that are related to geographic aspects of information systems.

5. CODING SYSTEM

In order to minimize repetition in referencing journals, proceedings, etc., of associations, organizations, etc., a coding system based on alphabetic ordering of the journals, associations, etc., has been devised.

ACRONYMS

AAAG	Annals of the Association of American Geographers
ACSM	American Congress of Surveying and Mapping
ASPO	American Society of Planning Officials, Proceedings of
CG	Canadian Geographer
JACM	Journal of the Association of Computing Machinery
JAIP	Journal of the American Institute of Planners
JASA	Journal of the American Statistical Association
MS	Management Science
PG	Professional Geographer
PE	Photogrammetric Engineering
PRSA	Papers of the Regional Science Association
TPIS	Threshold of Planning Information Systems
UAQ	Urban Affairs Quarterly
URISA	Urban and Regional Information Systems Association, Proceedings of
3rd ACUPISP	Third Annual Conference on Urban Planning Information Systems And Programs (Chicago: American Society of Planning Officials, Sept. 15-17, 1965).

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